Geophysical Research Abstracts
Vol. 13, EGU2011-1460, 2011
EGU General Assembly 2011

N saturation of temperate conifer forests in a warming Europe: lessons from temperate-like, relic fir forests currently under a Mediterranean-type climate

José A. Carreira, Roberto García-Ruiz, Mª Carmen Blanes, and Benjamín Viñegla
University of Jaén, Jaén, Spain (jafuente@ujaen.es / +34 953211873)

Chronic atmospheric N deposition is leading to forest N saturation symptoms over large areas of industrialised, temperate regions in Europe. Species composition, stand developmental stage and site factors are intrinsic factors determining the N critical load to forest ecosystems. However, climatic warming, through indirect effects on biotic and abiotic N retention mechanisms, could lead to decreased ecosystem N retention capacity and, thus, even nowdays moderate N deposition rates might become overthreshold in the future. In order to test this hypothesis we used relic Abies pinsapo-fir forests as the experimental model. Endemics from Southern Spain, these forests represent remnants of temperate-like conifer forests which are currently subjected to Mediterranean-type climate constraints, such as a high seasonality with a long summer drought, despite of annual rainfall values in the range typical for temperate regions (up to 2000 mm).
By combining conventional and 15N-labelling approaches, we concluded that A. pinsapo forests are intrinsically "leaky" regarding N cycling. Relatively high N outputs and nitrification rates were observed even in aggrading and N-limited stands, and this related to the seasonal uncoupling between peaks of biological demand for N and peaks of hydrological fluxes. We also found clear N saturation symptoms (e.g., low chloride to nitrate ratios in stream water, high foliar N/P ratios, no response of denitrification to nitrate additions) in areas receiving just 10-12 kg N/ha*yr. Our results suggest that, in a scenario climate warming and increased seasonality, the susceptibility of temperate forests under chronic N deposition to develop the N saturation syndrome will be increased. Particularly, the lag-period in which N-limited forests respond to N inputs by accumulating N will be shortened, the N saturation phase will be reached earlier, and forest decline will be more likely to occur.